Zhuoli Yin

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SUMMARY

I possess extensive experience in logistics and transportation systems, leveraging big data analytics, advanced artificial intelligence techniques, and operations research methodologies to tackle decision-making and optimization challenges. I have led multiple full life-cycle AI (GenAI & RL) development projects addressing problems in middle-mile network design, shared mobility rebalancing, vehicle routing optimization and online food delivery carbon emission quantification, following MLOps Principles. I am dedicated to working cross-functionally to deliver scalable and generalizable solutions and have a proven track record of collaborating with diverse and multidisciplinary teams.

EDUCATION

Purdue University, West Lafayette, IN, USA

Ph.D. Candidate in Operations Research, *School of Industrial Engineering* (GPA: 3.9/4.0) 8/2021-08/2026(Expected)

- Dissertation: "*Understanding and Optimizing Emerging Systems: from Electrified Mobility to AI*"
  - Fused multimodal generative AI and exact solvers to effectively solve large-scale routing problems.
  - Designed approximate heuristics algorithms to optimize rebalancing and recharging problems for real-world electric-scooter sharing systems
  - Developed an assessment framework to evaluate the energy cost and solution improvement of AI models with different configurations for routing problems to justify the opportunities of responsible computing.
- Graduate Certificate in Applied Statistics; Interdisciplinary Computational Science and Engineering Graduate Program

M.S. in Operations Research, *School of Industrial Engineering* (GPA: 4.0/4.0) 08/2019-08/2021

- Thesis: "Dynamic Bike Sharing Rebalancing: A Hybrid Framework Based on Deep Reinforcement Learning and Mixed Integer Programming"
  - Developed a deep reinforcement learning based approach to enable real-time bike rebalancing decisions in bike sharing systems for systems with 600+ service zones, 10+ workers, and 5000+ vehicles.

Beihang University, Beijing, China

B.E., *School of Electronic and Information Engineering* (GPA: 3.7/4.0, top 5%) 08/2015-07/2019

PROFESSIONAL EXPERIENCE

Amazon.com, New York, NY

Applied Scientist Intern, Global Transportation Services 06/2025-09/2025

- Developed next-generation AI-driven decision-support tools to **modernize middle-mile network design** across fulfillment centers, sortation stations, and delivery stations in the U.S to better manage demand uncertainty.
- Designed a graph neural network-based reinforcement learning framework that **shifts from single-day static optimization to dynamic, resilience-aware network design**, leading to higher promised-delivery rate and measurable reductions in warehouse backlog.
- **Collaborated cross-functionally** with applied scientists and data engineers to build multi-source data pipeline, including national-scale network portfolio, performance metrics, network similarity, and customer demands.
- **Led the full project cycle** from conceptualization, multi-source data analysis, large-scale simulation, AI model training, and minimum viable product (MVP) delivery.

RESEARCH PROJECTS

ViTSP: A Vision Language Models Guided Framework for Large-Scale Traveling Salesman Problems 10/2024 – 08/2025

- Developed a novel hybrid generative AI-OR paradigm enabling large-scale traveling salesman problems (TSPs, more than 10k nodes) optimization where learning-based methods and classical OR methods struggle.
- Leveraged pre-trained Vision Language Models (VLMs) to derive generalizable and scalable decomposition heuristics without dedicated GPU training.
- Conducted experimental comparison among TSP baselines to demonstrate ViTSP's performance. ViTSP outperforms LKH-3 by reducing its gaps by 12% to 100% and consistently surpasses existing learning-based approaches

A Deep Reinforcement Learning Model for Large-Scale Dynamic Bike Share Rebalancing with Spatial-Temporal Context 10/2020 – 10/2021

- Designed deep reinforcement learning models to optimize real-world station inventory for bike share systems, targeting systems with 600+ service zones, 10+ workers, and 5000+ vehicles.
- Enabled real-time rebalancing decision-making to meet high-frequent system operations, surpassing classical mixed-integer programming method and greedy methods.

Evaluating the Environmental Impacts of On-demand Food Delivery Service Considering Consumer's Food Consumption Behavior Change 05/2023-12/2023

- Designed a modeling pipeline to assign utility-maximized alternative restaurants for customers when on-demand delivery options are unavailable, based on surveyed behavioral and preference factors.
- Built a quadtree-based spatial search algorithm to efficiently retrieve citywide restaurant information via POI APIs, mitigating per-request query limits and improving data completeness.
- Developed a web-scraping framework to collect restaurant ratings, pricing, and customer reviews; cross-validated restaurant matching using semantic similarity derived from pre-trained LLMs to ensure high-quality data integration.

LLM-based Automated Emission Factor Extraction and Assignment from Literature 01/2023 – 11/2023
- Implemented a real-time workflow for automatically processing JSON and XML-based literature metadata.
- Devised a large language model-powered system for unsupervised emission factor extraction of life cycle assessment literature from long documents with 90%+ accuracy, validated with ground-truth data.
- Collaborated with scholars in computer science and environment to write a proposal for Amazon Research Award.

Developing an AI-powered teaching assistant tool for Engineering Economics 05/2022-08/2022
Graduate Research Assistant, Purdue University, West Lafayette, IN, USA
- Led a complete development lifecycle of a machine-learning-based educational assistant tool in predicting personalized mistakes and managed a domain-specific dataset of 3,000+ entries.
- Collaborated with software engineers to maintain website functionality over 2 years after implementation.
- Developed novel feature mask-based data augmentation techniques to improve prediction accuracy.
- Initiated copyright disclosure with the Office of Technology Commercialization at Purdue University.

SELECTED PUBLICATIONS

Peer Reviewed & Under Review

[1] Liu, Y., **Yin, Z.,** & Cai, H. (2025). Enhanced global oil spill dataset from 1967 to 2023 based on text-form incident information. *Scientific Data*, 12(1), 1-14. https://doi.org/10.1038/s41597-025-05601-9

[2] **Yin, Z.,** Kou, Z., & Cai, H. (2023). A Deep Reinforcement Learning Model for Large-Scale Dynamic Bike Share Rebalancing with Spatial-Temporal Context. *In Proceedings of the 12th International Workshop on Urban Computing. ACM, Long Beach*. https://urban-computing.com/urbcomp2023/file/UrbComp2023_paper_7.pdf

[3] **Yin, Z.,** Hardaway, K., Feng, Y., Kou, Z., & Cai, H. (2023). Understanding the demand predictability of bike share systems: A station-level analysis. *Frontiers of Engineering Management, 1-15*. https://doi.org/10.1007/s42524-023-0279-8

[4] **Yin, Z.,** Ding, Y., Khir, R., and Cai, H. ViTSP: A Vision Language Models Guided Framework for Large-Scale Traveling Salesman Problems. (*Under Review*) *ICLR 2026*. https://arxiv.org/pdf/2509.23465

[5] **Yin, Z.**, Bass, K., Karakaya, E., & Cai, H. Arthur: An Artificial Intelligence Powered Teaching Assistant Tool for Engineering Economy Class. (*Second-round Review*) *International Journal of Artificial Intelligence in Education*.

[6] Chen, H., **Yin, Z.**, Jian, X., Dang, M., Chen, W., Cai, H., On-Demand Food Delivery Reshapes Urban Diets and Increases Emissions. (*Under Review*) *Nature Cities*.

[7] Li, S., **Yin, Z.**, & Cai, H. Assessing the Food-Emissions-Water-Land (FEWL) Impacts and Reduction Potentials of U.S. Household Diets. (Under Review) Science of the Total Environment.

Working Papers

[8] **Yin, Z.**, Khir, R., & Cai, H. Integrated Dynamic Rebalancing and Decentralized Charging Strategies for Electric Scooter Share Systems. To be submitted to *Transportation Research Part-B*.

[9] **Yin, Z.**, Ding, Y., Khir, R. & Cai, H. When do AI use help improve sustainability? An evaluation of marginal benefits and additional costs in transportation models. To be submitted to *Environmental Science & Technology*

TEACHING EXPERIENCE

Instructor, Purdue University, *IE343 – Engineering Economics* 08/2023 – 12/2023
- Taught 150 undergraduate students from 10 different engineering disciplines.
- Fully responsible for the class and supervised two teaching assistants and two graders.

Guest Lecturer, Purdue University, *EEE560 – Environmental Data Science* 10/2024 – 10/2024
- Taught 40 graduate students on leveraging artificial intelligence and applicable data for environmental problems.
- Led the discussion on the state-of-the-art artificial intelligence algorithms and provided feedback to students' group research proposals.

AWARDS & HONORS

Graduate Showcase Honorable Mention Poster Award, Purdue (2022); Seth Bonder Foundation Student Scholarship (2022); Graduate School Summer Research Grant, Purdue (2023); Lee A. Chaden Fellowship in Industrial Engineering, Purdue (2023); IISE Future Faculty Fellow (2024); National Science Foundation Student Travel Award (2025)

LEADERSHIP & SERVICE

Vice President, Industrial Engineering Graduate Student Organization, Purdue (2022-2023); Student representative in faculty search committee (2023); Graduate Mentor in research, advised 6 undergraduate students, including 4 women.

SKILLS

- **Programming & Software**: Python (Pandas, NumPy, Matplotlib), Linux, Object-oriented programming, Git, SQL
- **AI & ML**: vLLM, Google Cloud Platform, Hugging Face, AWS, TensorFlow, PyTorch, Scikit-Learning, XGBoost
- **Optimization**: Mixed integer programming, Simulation Optimization, Reinforcement learning, Gurobi, NVIDIA cuOpt
- **Statistics**: Hypothesis testing, Regression analysis, Inferential statistics

Last Updated on 12/4/2025